There is at the present time a good deal of sporadic information as to the water supplies and resources in various localities, and mining engineers have, from their experience, some knowledge of the subsoil or underground waters, for these, of course, are the enemy with which they have to contend in their operations; but there is no general survey to determine what are the supplies and what are the water resources of this country; there is no general knowledge as to the underground water supplies. We know that in many districts these are being pumped for supply; in many where mining is going on they are, with reckless economy, being pumped to waste. But what is required is a comprehensive knowledge both of the overground and underground reserve forces for water supply, and until that is prepared any legislation with regard to water supply must be merely hand to mouth, unscientific, and futile; and this seems to have been the wise opinion of Mr. Lithiby, of the Board of Trade, who gave evidence before the Joint Select Committee on the Water Supplies Protection Bill, which sat and reported during the last session of Parliament.

The necessity for the acquisition of such knowledge is emphasised by the proceedings and report of the Royal Commission which has been inquiring and reporting upon canals and waterways since the year 1906. No one can say that the investigations of that commission have not been exhaustive, although many may think that the reservations of Lord Farrer and three other commissioners seem to show that their labours will prove absolutely futile. But the commission has gone further, and proposes to improve the waterways of England, and great new or improved canals are to connect the Midlands and South Staffordshire with the estuaries of the Thames, the Humber, the Mersey, and the Severn. These four routes, which are, after all, only to be large barge canals, suited for barges of, in one scheme, 100 tons burden, and in another of 300 tons burden, are, in the report, referred to as the "cross," and if this gigantic scheme is carried out at an expense, according to Sir John Wolfe Barry's estimate, of, for the small scheme, 13,393,483*l.*, or for the large scheme of 24,513,823*l.*, certainly England would be financially crucified. But criticism of that imaginative proposal forms no part of my present purpose. It is only interesting to me to note that after the commission had adumbrated this idea, and ascertained approximately the cost of constructing the "cross," which, as I have said, would be a cross greater than England could bear, they bethought themselves how they were to get water for their canals—in the deplorable absence of the Alps—and they instructed an engineer to survey and inquire and to give them an estimate of the cost of getting the water. I have no doubt he did his work as well as he could. He found ready to his hand the admirable statistics as to rainfall which are collected by Dr. Mills, but complains, rightly enough, that "other questions connected with the national water supplies appear to receive less attention." Of course, it is quite an exception to find anywhere river gaugings, and the engineer in question says:—"This inquiry has shown the necessity, if such problems as those which the following reports attempt to solve are to be thoroughly investigated in future, of some public authority being charged with the duty of recording the flow of rivers, and of the proportion of the rainfall available or run-off in catchment basins overlying different geological strata in various parts of the country."

But this claim to water for canals, which, according to the reporter, would involve an expenditure of 1,194,000*l.*, without including the cost of obtaining the power or the cost of water compensation, and is, of course, in addition to the sums estimated for construction by Sir John Wolfe Barry, raises again in an acute form the whole question of our national supplies, and points to the absolute necessity now of some systematic dealing with this great question. The nation is being forestalled by municipalities, and here is a suggestion that a Canal Board should lay a gigantic hand upon some of our sources of supply. The time for dealing with the matter is *now*; but, as in other cases, it is quite likely that the matter will be postponed until it is "too late."

## *SELF-LUMINOUS NIGHT HAZE.*[1]

THERE is one phase of the night skies which does not seem to have received much or any attention. It is the occasional presence of self-luminous haze. This matter does not seem to be similar to the luminous night clouds, "die leuchtenden Nachtwolken," which were observed by O. Jesse and others some twenty-five or thirty years ago, and were found to be clouds at such great altitudes above the earth's surface (upwards of 50 miles high) that they received the sunlight long after or before the ordinary clouds. The observations of O. Jesse were printed in the *Astronomische Nachrichten*, Bd. 121, pp. 73, 111; Bd. 130, p. 425; Bd. 133, p. 131; Bd. 140, p. 161. In *Astronomische Nachrichten*, Bd. 140 (No. 3347), he gives a long list of altitudes, determined by photography, which range from 81 km. to 87 km. The mean value given by the observations from 1885 to 1891 was 82 km. (52 miles). These clouds were seen in the northern hemisphere only near the time of the summer solstice. In the southern hemisphere they were seen at the opposite season. From his papers it is clear that these sunlit clouds were in no way related to the present subject, and I only mention them to forestall any suggestion that they were similar to the ones seen by me.

The objects to be described here were apparently at the altitude of the ordinary higher clouds. They have been seen in all parts of the sky and at all hours of the night. In a paper on the aurora[2] I have previously directed attention to the frequent luminous condition of the sky at night. This feature long ago impressed itself upon me. Indeed, anyone who has spent much time under the open sky hunting comets, &c., will have been forcibly impressed with this peculiarity. In most cases this illumination has been due, evidently, to a diffusion of the general star light, perhaps by moisture in the air. This latter condition is present as a whitening of the sky, which gives it a "milky" appearance. At other times the sky is more or less feebly luminous; but the luminosity is different from the other condition, and is evidently not due to a diffusion of star light. In reality, the sky seems to be self-luminous. Sometimes the whole sky has this appearance, and at other times a large portion only. At times the illumination is so great that the face of an ordinary watch can be read with no other light than that of the sky. It is indeed seldom that the sky is rich and dark. In any determination of the total amount of the light of the sky the results must be uncertain, because of the great changes that so often take place in the amount of the illumination. The self-luminous condition frequently occurs when no ordinary indications of an aurora are present. It is, nevertheless, doubtless of an auroral nature, for Prof. Campbell has shown that the spectrum of the aurora is essentially always present on a clear dark night (*Astrophysical Journal*, 2, August, 1895, p. 162).

I have given an account[3] of the remarkable pulsating clouds of light that are seen here occasionally, which usually, but not always, have an easterly motion—generally south-east. They are mostly confined to the northern half of the heavens. There is another phenomenon that has been visible on a number of nights of last year, and also in the present year, of which I have seen no record. This consists, usually, of long strips of diffused luminous haze. I believe that this is really ordinary haze which for some reason becomes self-luminous. It is not confined to any particular region of the sky nor to any hour of the night. It always has a slow drifting motion among the stars. This motion is comparable with that of the ordinary hazy, streaky clouds that are often seen in the daytime. They are usually straight and diffused, and as much as 50° or more in length and 3° or 4° or more in width. In some cases they are as bright, or nearly as bright, as the average portions of the Milky Way—that is, they are decidedly noticeable when one's attention is directed to them. They apparently are about as transparent as ordinary haze. Sometimes, when seen near the horizon,

[1] From a paper read before the American Philosophical Society on April 21, by Prof. E. E. Barnard.
[2] *Astrophysical Journal*, 31, April, 1910.
[3] *Astrophysical Journal*, 31, April, 1910, p. 210, &c.

where they may be quite broad, they have strongly suggested the "dawn" or glow that precedes a bright moonrise. Their luminosity is uniformly steady.

The reason I refer to this matter as haze, and the reason I think it is only ordinary haze made self-luminous, is because on one occasion I watched a mass of it in the north-western sky which was slowly drifting northerly in the region of the great "dipper" of Ursa Major as daylight came on. These hazy luminous strips had been visible all the latter part of the night—new strips coming and going slowly, sometimes several being seen at once. As daylight killed them out I noticed, when the light had increased sufficiently, that there were strips of ordinary haze exactly the same in form and motion, and occupying the same region of the sky. I am sure they were the same masses that had appeared luminous on the night sky. My impression, therefore, is that these hazy luminous strips were only the ordinary haze which had for some reason become self-luminous. I am specially certain that these masses are not luminous as a result of any great altitude which might bring them within reach of the sun's light, for they were frequently seen in such positions that the sun's rays could never reach them. The sun or moon, therefore, had nothing to do with their illumination. It is also needless to say that they are not related to the pulsating auroral clouds which I have previously mentioned.

I have not noticed this luminous haze in former years, though it may have been present; and did it not seem unreasonable, one might suspect some relation between this condition of the atmosphere and the possible passage of the earth through a portion of the tail of Halley's comet on May 19, 1910.

It seems to me that these objects should be observed and a record made of the times of their visibility and their motion, &c. It would be valuable to have records of them from different stations to see if their luminosity is due to some general condition of the earth's atmosphere at the time. It is not probable that this luminosity is in any way due to local conditions. In the records here given, it is possible that on one or two occasions an aurora was also present, but I have tried to confine the accounts to what I have called, and believe to be, self-luminous haze. They were not seen previous to June 7, 1910.

[Prof. Barnard then gave details of observations made on various dates from June 7, 1910, to March 2, 1911.]

## *UNIVERSITY AND EDUCATIONAL INTELLIGENCE.*

AN advanced course of instruction on "The Systematic Design and Manufacture of Dynamo-electric Machinery" will be given at the City and Guilds (Engineering) College, South Kensington, during the forthcoming session, under the general supervision of Prof. T. Mather, F.R.S., professor of electrical engineering at the college. The course is to prepare men to take up positions as designers in electrical works. It will deal with present-day problems in design, construction, and testing, in a thoroughly practical manner. An experienced designer and draughtsman, specially engaged for the purpose, will devote his whole time to the drawing-office work in connection with the course. The course is intended for post-graduate and other duly qualified students, the number of which will be strictly limited. Application for admission to the whole course, or parts thereof, should be made by letter to the Dean, City and Guilds (Engineering) College, Exhibition Road, London, S.W.

THE President of the Board of Education has appointed a departmental committee to inquire and report—(*a*) Whether it would be inconsistent with due regard to educational and hygienic considerations that the *minimum* standard of playground accommodation for new public elementary schools prescribed in the Building Regulations of the Board of Education—viz. 30 feet per head of accommodation—should be modified or adjusted according to the size, design, or situation of schools, the proximity of recreation grounds or open spaces, the density of population, the cost of land, or otherwise. (*b*) How far it is possible or desirable to define more precisely the standard of playground accommodation which the Board of Education will require under the Code of Regulations for Public Elementary Schools in the case of existing schools or to regulate the practice of the Board of Education in dealing with cases in which the playground accommodation is considered to be insufficient. The committee will consist of Mr. L. A. Selby-Bigge, C.B., principal assistant-secretary of the Elementary Education Branch of the Board of Education (chairman); Sir George Newman, chief medical officer of the Board of Education; Mr. J. C. Iles, H.M.I., divisional inspector for the North-western Division; Mr. F. H. B. Dale, H.M.I., divisional inspector for the Metropolitan Division; Mr. A. B. McLachlan, of the Local Government Board; with Mr. L. J. Morison as secretary.

THE latest report of the U.S. Commissioner of Education gives some interesting statistics of the so-called land-grant colleges, established under the provisions of the Act of Congress of July 2, 1862, and receiving aid from the Federal Government from funds provided by Acts of Congress of 1890 and 1907. Each State received from the U.S. Treasury during the year ended June 30, 1910, the sum of 8000*l.* for the benefit of these land-grant colleges—commonly called agricultural and mechanical colleges—making a total of 400,000*l.*, exclusive of the sums paid for experiment-station purposes, expended by the Federal Government in aid of these colleges. There are sixty-eight of these institutions, sixteen of which are separate institutions for the coloured race. These colleges are in a period of rapid growth, shown by a marked increase in the number of instructors and students and the value of their property and income. The total number of instructors during the year in all departments of the sixty-eight colleges was 6665, of which 742 were women. The total number of students enrolled for the year was 80,646, an increase of 9·6 per cent. over the preceding year. The total value of the property held for the benefit of these colleges amounts to 23,568,600*l.*, an increase for the year of 910,000*l.* The total income from all sources, excluding the grants for experiment stations, was for the year about 4,180,000*l.*, an increase of some 459,000*l.* during the year.

THE "Directory for Higher Education, 1911–12," issued by the Education Committee of the Staffordshire County Council, contains the regulations of the committee and details of schemes in operation throughout the county. Very complete provision is made for technological instruction, and among the subjects catered for the following may be mentioned:—Instruction in mining is provided by means of lecturers, whose whole time is devoted to the work, and their assistants. For this purpose the county is divided into two portions, comprising the North Staffordshire coalfields and the South Staffordshire coalfields respectively. Theoretical and practical classes in metallurgy and iron and steel manufacture are conducted in accordance with the regulations of the Board of Education and the City and Guilds of London Institute. Instruction is also provided in pottery and porcelain manufacture, boot and shoe manufacture, silk manufacture, and in wrought-iron work. In order to enable teachers in elementary and secondary schools to impart instruction in various branches of technical and manual training, the committee provides special classes at convenient centres. In localities where suitable instruction is provided already, classes in approved subjects are recognised by the committee, and with the object of encouraging the attendance of teachers at such classes, grants towards their railway fares are made. The work of the committee in rural districts falls under three heads: instruction directly supplied in special subjects, viz. agriculture, horticulture, hygiene, domestic subjects, and wood-carving and drawing; evening schools taught by local teachers, and earning a grant from the Board of Education; and experimental and demonstration plots.

THE Charity Commission has given notice that it proposes to make an order establishing a scheme for the future regulation of the People's Palace in East London. The scheme sets forth that with reference to the administration of the East London College, in connection with